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THE SPINNING QUALITY OF TEXAS COTTON



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According to statements published over a long period of time in many technical books and treatises bearing on cotton, Texas cotton is "A clean, light brownish lint, with hard-bodied character, and suitable for warp yarn up to 50s count." Although that definition does not fit Texas cotton as we know it today, it is difficult, or rather impossible, to know even the degree to which this definition actually described the cotton grown in Texas 40 or 50 or more years ago, since adequate data from controlled laboratory tests are either lacking or extremely scanty. It does seem likely, though, that the largest proportion of the cotton grown in Texas up until the early years of this century was of the so-called "Texas Big Boll" type. So, to this extent, the published description may have been fairly accurate in certain respects, although it certainly would appear that the successful spinning of an acceptable yarn "up to 50s count" was an extremely optimistic claim of attainment for any cotton of 15/16 or 1 inch staple.

The term "Texas cotton" may be sufficient to distinguish this lint from such radically different growths of cotton as sea-island, Egyptian, or Chinese, but it certainly is not specific and precise enough to describe a type of American upland cotton. In the last 30 years or so, many varieties of cotton have been introduced and grown in Texas, and it is estimated by agronomists and others that several hundred so-called varieties (or variety names used to describe the cottons) have been grown here. And, on a basis of our more recent spinning and fiber data, the importance of variety, or inheritance, as a factor in determining the spinning and fiber quality of a cotton is more evident now than ever before.

Thus, it is clear that a range of quality exists in the cotton grown in Texas today. This is borne out forcefully by the Department's statistics concerning the staple lengths in the Texas crop, as compiled by the Agricultural Marketing Service. In 1939, for example, a substantial proportion of the crop produced in Texas was below 7/8 inch in staple, and the lengths found ranged up to 1-1/16 inches and even longer. Staple length is, however, only one of many elements of quality involved in cotton. That is to say, although there are no official standards for cotton character, our spinning results unmistakably reveal that the character or "spinning utility" of Texas cotton available today also covers a wide range.

What do foreign and domestic spinners think of Texas cotton? At the moment, no doubt, European spinners would be willing to pay almost any price for almost any kind of cotton, but what did they think of Texas cotton when they were last able to get it? Few facts and figures are available to answer this question precisely. On the one hand, however, we know that more than one-half of the American exports in recent years have been comprised of Texas cotton and that over 90 percent of the cotton grown in Texas has been exported. On the other, we know of the criticisms that European spinners have voiced against American cotton. For example, the International Cotton Congress, meeting in Rome in 1935, adopted the following resolution: "The Congress directs the attention of the United States Government to the gradually deteriorating quality of American cotton, which is undoubtedly one of the reasons for the diminishing consumption of such cotton."

The resolution goes on to say: "In recent years the Governments of other cotton-growing countries (meaning countries other than the United States) have concentrated upon and succeeded in improving the quality of their crops to the advantage of both growers and spinners alike, and this Congress is of the opinion that the quality of the American cotton crop demands the most urgent and immediate attention on the part of the United States of America if they wish to maintain their position in the markets of the world."

Although this resolution was phrased so as to apply to American cotton in general, it probably referred to Texas cotton in particular, in view of the large proportion of the cotton exported to Europe by this State.

That something is being done about American cotton in general and Texas cotton in particular will be demonstrated in a few moments. Before we go into that matter, let us consider, first, the other half of the question; that is, what do American spinners think of Texas cotton? Under present world conditions and outlook, such reactions are of great importance to Texas growers; in fact, greater than ever before.

Statistics collected by the Department through its Agricultural Marketing Service do not give a direct answer to this question. They do show, though, that for the 1938-39 season cotton spinners in the Southeastern States purchased only about 10 percent of their American cotton from the Southwestern States. This entire 10 percent was not, of course, all Texas cotton. Nearly half of the cotton consumed by southeastern mills that year came from the Southeast itself, most of the rest being of the longer stapled Delta types. The chief reason for their apparent preference for southeastern cotton in the shorter lengths is undoubtedly the extra cost of transporting the western cotton to the mills. Thus, it may be concluded that the mills of the Southeast do not think enough more of Texas cotton to pay half a cent a pound more for it, which is about what the difference in transportation or freight charges for the two regions would be. As to the mills in the non-cotton producing States, chiefly in the New England section, about one-third of the American cotton that they consumed came from the Southwest area from which it could be landed at these mills about as cheaply as could southeastern cotton.

From these facts it appears that, from the standpoint of the mills in this country, the choice between Texas cotton and other American growths of comparable staple length has been determined chiefly by price which, in turn, has been influenced by transportation charges to a degree that affects the choice.

Although staple length is only a partial indication of quality, it may be of interest to see what, if anything, has happened to the average length of the Texas crop in relation to that of the entire crop. For the 11-year period ending with the last crop, there has been a definite upward trend in the staple length of the American crop, including Texas, amounting to an average of about 1/16 inch. During this period, there was a definite decrease for about 8 years in the average length of Texas cotton, followed by an increase. Last year the Texas crop averaged about 1/64 inch longer than it was in 1929, and about 1/16 inch shorter than the average for the American crop.

The increase in the average staple length of the crop is undoubtedly due in a large measure to the Cotton Improvement program inaugurated a few years ago. This program was given considerable impetus three years ago when Congress passed the Smith-Doxey Act, providing for free cotton classing for organized groups. The cotton producers of Texas and other States have shown an increasing interest in this service, and last year 1,525,000 samples were classed under the provisions of this Act for 1573 organized groups throughout the country.

In Texas during the last 6 years, the Cotton Improvement program has grown about 18-fold in number of communities participating, and about 22-fold in the acreage planted in cotton. In 1940, there were 573 one-variety communities in Texas, involving about 1-3/4 million acres, with a production of 3/4 million bales. About 21 percent of the Texas cotton acreage in 1940 was included in the one-variety community program, as compared with about 19 percent for the country as a whole. This is all well and good, of course, provided that the varieties selected by these groups have desirable spinning quality, coupled with high yield and lint turn-out. The spinning and fiber tests conducted by the cooperative laboratories of the Department are, it is believed, furnishing valuable information on the subject of quality.

In cooperation with the Texas Agricultural and Engineering Experiment Stations, the Department maintains at College Station a completely equipped laboratory for testing the quality of cotton. A similar laboratory is located in South Carolina, in cooperation with the Clemson Agricultural College. Each of these laboratories contains complete equipment for manufacturing and testing yarn and cord under the most precise and accurately controlled conditions. In addition, each laboratory is equipped to make measurements of cotton fiber length, strength, fineness, and immaturity. In the Department's laboratories in Washington, other apparatus is used for making color, chemical, and X-ray analyses.

Naturally, all of these tests take time to make, and trained technologists to conduct the work. At the College Station laboratory there is

a staff of 11 technical and clerical workers, and this group can make complete spinning and fiber tests at an average rate of slightly better than one sample of cotton a day. This may appear to be a very slow rate to one who is not familiar with the work. But, when it is remembered that in a spinning test alone, a sample of cotton passes through from 9 to 18 different manufacturing processes, and that large numbers of weighings and other tests have to be made at frequent intervals, it will be recognized that considerable time and effort are necessary for this work if dependable data are to be obtained.

In the 4-1/2 years that the laboratory has been in operation, more than 260 samples of cotton grown in Texas have been tested. Much of the effort at the laboratory has been exerted on the country-wide regional variety studies, of which the Texas Agricultural Experiment Station and its workers have taken an active part. Now that this laboratory work of the 3-year regional variety series across the Cotton Belt has been completed, however, it is expected that even more laboratory attention will be given to Texas cottons in the future than has been possible during the past.

For purposes of this discussion it will not be necessary to go into the details of the regional variety studies for the Cotton Belt as a whole. It will be sufficient only to point out that complete spinning and fiber tests have been made on 768 samples of cotton, representing two replicates of each of 16 varieties grown at 8 locations over the Cotton Belt for 3 successive crop years. This is the most comprehensive study that has been conducted to date to furnish information on the influence of variety, location, and climate on the quality of cotton.

Two of the eight locations included in these tests are in Texas - College Station and Lubbock. The relative standing of these two stations will be of interest, therefore, in a consideration of the spinning quality of Texas cotton. On an average, the cottons grown at the two Texas stations were somewhat shorter in staple than those from the other stations. But the ranking of the Texas cottons with respect to the strength of the yarns spun from them was higher than might have been supposed from this fact. For example, the College Station cottons, when averaged together, ranked sixth, sixth, and eighth in staple length for the 1935, 36, and 37 crops, respectively. The yarn strengths for the same cottons, however, ranked second, fifth, and first for those same years. This would suggest that the College Station samples were of better-than-average character. Reference to the results of fiber tensile strength tests shows that this is so, as on an average the cottons ranked second, second, and first in this respect. The Lubbock cottons were not as high in fiber strength, and for the first 2 years the yarns ranked a little below the average of the eight stations, tested for the Belt as a whole.

Referring again to the one-variety cotton communities in this State we note that in 1939, most of the cotton planted in the 422 communities was of the following varieties, which are listed in the order of the number of communities adopting them: Acala, Mobane, D. & P. L., Lone Star, Paymaster, Rowden, Delfos and Stoneville. It should be understood that these are the

parent varieties, and that for many of them there are numerous strains, some of which for commercial reasons are designated by other names or identifying means. Because of the limitations in the capacity of the laboratory previously pointed out, and of the range of tests which the laboratory is called upon to do, it has not been possible to test all important strains of these varieties. The following brief summaries will show, however, the more important spinning and fiber test features for many of the cottons adopted by the one-variety communities.

Acala. Staple length, $31/32$ to $1-1/32$ inches. This variety illustrates well the wide range in spinning and fiber quality that different strains of a given variety can possess. And it may be said, in this connection, that it is doubtful whether this fact has been given due consideration in the selection of Acala planting seed in Texas. We cannot, of course, do anything about the water that already has gone over the dam but we can do something about that which goes over in the future, provided we have adequate facts and are willing to use them without bias or prejudice.

To illustrate, in practically all variety tests made to date in our laboratories, the Rogers Acala generally has stood either at or near the top of the list. With regard to the Acala samples, the Rogers Acala has stood considerably above the other Acala samples. Low waste percentages and high yarn and cord strengths have been found consistently. Possibly its only shortcoming is its slight tendency to produce rough yarns. Rogers Acala is somewhat finer-fibered than most upland varieties, and possesses very high fiber strength.

In contrast to Rogers Acala is the so-called Shafter or California strain of this cotton. In practically all tests of this cotton as produced under rainfall conditions, the lint has been found to be wasteful, and the yarns rough and nappy, and of about average strength. In one case, where the cotton was grown in a comparative test at Victoria, it was found to possess satisfactory quality, but in practically all others its quality has been found to range from slightly below average to extremely poor.

In the Victoria test, Texacala, and the Lentz and Hasselfield strains of Acala were also found to possess high spinning value. In fact, they all made stronger yarn than did the Shafter Acala even though they were classed $1/16$ inch shorter.

Mebane. Staple length, $29/32$ to $1-1/32$ inches. During the past year, 7 strains of Mebane have been tested, as follows: Mebane 140, A.D. Mebane Estate, Bryant Mebane, Buckellow Mebane, Cliett, Watson, and Qualla. There is, of course, some variation among these strains, and within a particular strain grown at different points. Nevertheless, there are certain characteristics that seem to be more or less common to all of the strains tested. Although one or two samples produced strong yarns, as, for example, Mebane 140, the yarns of which were 10 percent stronger than the average for its length, in general these strains are about average in this respect. Most of the cottons of this variety were somewhat below average in fiber

strength, and were medium- to coarse-fibered. All were found to spin well, yielding less than average quantities of manufacturing waste, and producing yarns of good appearance. In general, it may be said that these strains of Mebane would appeal to manufacturers of goods in which normal spinning quality is desired, but in which unusually high tensile strength is not important.

D. & P. L. (Deltapine 11, 11A, and 12). Staple length varies from 1 to 1-1/16 inches. Practically all the samples of this variety tested in the Department's laboratories have been found to be medium-fine in fiber weight, of average maturity, and of average to somewhat lower than average strength. Its spinning quality is found to be desirable from the standpoint of wastiness, yarn appearance, and general manufacturing performance, and the tests indicate that it should be a satisfactory cotton for many yarns and fabrics where outstandingly high strength is not an essential factor. Tests to date have shown only very small differences among Deltapine 11, 11A, and 12.

Lone Star. Staple length, 1 inch and 1-1/32 inches. Several different strains of this cotton have been tested over a period of years at the Service's laboratories. Its spinning quality is usually somewhat better than average, and it appears to show up well under both rainfall and irrigated conditions. The quality of the lint is somewhat similar to Rogers Acala, except that it is coarser and not quite so strong.

Rowden. Staple length generally is about 15/16 or 31/32 inches. Strains recently tested have included Rowden 2088, Sunshine, Roldo Rowden, Malone Rowden, and Miller. This cotton is outstanding for its coarse, highly mature, and strong fibers. This combination of properties makes a hard-bodied cotton that is very desirable for many types of manufactured products. The cotton yields a low to average percentage of manufacturing waste and produces yarns of good strength and smooth, even appearance. One or two of the strains included in the 1940 tests were somewhat disappointing in yarn strength and manufacturing waste. On the other hand, Rowden 2088 has consistently given good results to date.

Delfos. There are a large number of strains of this variety, differing considerably in staple length, and it has not been possible for the spinning laboratory to test many of them. Generally speaking, this cotton possesses about average fiber properties except that its immaturity count is somewhat higher than that of most others. Grade statistics show that the lint is about one grade lower than that of many other varieties selected by one-variety communities, and in the spinning tests Delfos has been found to be rather rough and neppy.

Stoneville. Staple length, 1 inch to 1-1/16 inches. This is another cotton that has shown up well in our laboratory tests. Its quality has been found to be consistently good when grown under a wide variety of soil and climatic conditions. It is characterized by medium fineness, and average-to-strong fiber strength. Its only shortcoming appears to be a tendency toward rough yarns, but it is not as objectionable in this respect as a number of other well-known varieties of about the same staple length.

Paymaster. No spinning tests have been made in our laboratories on this variety of cotton.

We have already completed this year a series of spinning and fiber tests of 49 different samples of cotton furnished through the cooperative efforts of the Texas Agricultural Experiment Station and the Bureau of Plant Industry. The cottons were grown at Greenville, Chillicothe, Temple, College Station, and Victoria, and include many well-known varieties as well as special new strains which have not yet been produced commercially. At the present time a report of these tests is being prepared, and it is hoped that the summarized findings can be made available in the near future to both individuals and groups of planters, as well as to cotton breeders and agronomists. Copies of the results have already been transmitted to the breeders of the cooperating Texas Agricultural Experiment Station and the specialists of the cooperating Bureau of Plant Industry.

With the loss of the major foreign markets for Texas cotton, which we all hope is only temporary, it is now more important than ever for Texas farmers to produce the qualities of cotton desired by domestic spinners. We have already seen indications this year that southeastern spinners are evidencing a greater interest in Texas cotton. The demand for it will be determined, of course, by price and quality. Regardless of what they can do about price, the cotton farmers of Texas certainly can control quality to a considerable extent by planting the varieties that are known to be the best.

Data on yield, staple length, and lint turnout on these cottons are available at the State Experiment Station. By considering this information carefully, in conjunction with the spinning and fiber quality data being obtained in the cooperative laboratories, it is possible for farmers in the areas where the cottons in these tests were grown to select a variety that will ensure a high cash value for the crop, and at the same time produce a quality that will appeal to the spinner. In this latter connection, we are finding that manufacturers are paying more and more attention to the varieties of cotton that will meet their requirements, and to sources from which they may obtain cotton of those varieties. They are studying the findings of these spinning tests with just as much interest as the producers. They are also studying lists published by the Department of Agriculture showing the name of the variety planted by each one-variety community. All signs now point to a new era in cotton marketing as a result of this work, in which the producer will grow what the mill wants, and the spinner will be able to locate ample supplies of just the quality of cotton he needs.

To arrive at this goal, however, is going to mean, first of all, a substantial reduction in the number of varieties of cotton that are grown in this country. It has been estimated that instead of the literally hundreds of so-called varieties of cotton now being grown in the United States, the requirements of domestic and foreign spinners could well be met by decreasing this number to perhaps not more than 12 or 15. This certainly does not mean that fewer breeders would be required. Instead it means that their improvement efforts, talent, and money would be more concentrated and less thinly spread out, and that as a consequence, they would

be more productive and beneficial to all concerned with American cotton. Whether or when the number of varieties will ever be reduced to such an extent is problematical. But our increasing fund of knowledge regarding varieties and the increasing interest in the subject on the part of the manufacturer, together with the converging of both producers' and spinners' interests in the Cotton Improvement program, are bound to result in the growing of fewer varieties and in the production of better cotton.

Much remains to be done, but the cooperative work being conducted by the Southern State agricultural experiment stations and colleges and by the various agencies of the United States Department of Agriculture, is beginning to yield results of practical and far-reaching value.